OPIC
OFFICE DE LA PROPRIÉTÉ INTELLECTUELLE DU CANADA

CIPO
CANADIAN INTELLECTUAL PROPERTY OFFICE

(12) (19) (CA) **Demande-Application**

(21) (A1) **2,228,479**
(86) 1996/07/10
(87) 1997/02/06

(72) GUBO, Wolfgang, AT
(71) Dr. Kuhn AG, CH

(51) Int.Cl.^{6} C09K 3/10
(30) 1995/07/17 (A 1208/95) AT

(54) **SYSTEME D'ETANCHEITE COUPE-FEU A BASE DE COLLES A FUSION ET PROCEDE PERMETTANT DE RENDRE ETANCHES, TOUT EN LES RENDANT RESISTANT AUX FLAMMES, DES OBJETS OU DES OUVERTURES**

(54) **FIREPROOF SEALING SYSTEM BASED ON MOLTEN ADHESIVES AND PROCESS FOR THE FLAMEPROOF SEALING OF OBJECTS OR APERTURES**

(57) L'invention concerne des systèmes d'étanchéité coupe-feu à base de colles à fusion, qui contiennent a) une colle à fusion, b) des liants, c) des substances produisant un squelette de carbone en cas d'incendie, d) des agents de protection contre les flammes, ainsi que e) un constituant intumescent en cas d'incendie. L'invention concerne en outre un procédé permettant de rendre étanches, tout en les rendant résistant aux flammes, des objets ou des ouvertures, par application de ces systèmes d'étanchéité.

(57) The invention relates to fireproof sealing systems based on molten adhesives, containing a) a molten adhesive; b) binders; c) substances forming a carbon structure in the event of a fire; d) flame-protecting agents; and e) a component which swells in the event of a fire; and a process for the flameproof sealing of objects or apertures by the application of such sealing systems.

PCT WELTORGANISATION FÜR GEISTIGES EIGENTUM
Internationales Büro
INTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

(51) Internationale Patentklassifikation 6 : C09K 3/10, C09J 123/02 — A1

(11) Internationale Veröffentlichungsnummer: WO 97/04037

(43) Internationales Veröffentlichungsdatum: 6. Februar 1997 (06.02.97)

(21) Internationales Aktenzeichen: PCT/EP96/03016

(22) Internationales Anmeldedatum: 10. Juli 1996 (10.07.96)

(30) Prioritätsdaten:
A 1208/95 17. Juli 1995 (17.07.95) AT

(71) Anmelder *(für alle Bestimmungsstaaten ausser US)*: DR. KUHN AG [CH/CH]; Bahnhofstrasse 32, CH-6300 Zug (CH).

(72) Erfinder; und
(75) Erfinder/Anmelder *(nur für US)*: GUBO, Wolfgang [AT/AT]; Reischekstrasse 35, A-4020 Linz (AT).

(74) Anwalt: MERKLE, Gebhard; Ter Meer, Müller, Steinmeister & Partner, Mauerkircherstrasse 45, D-81679 München (DE).

(81) Bestimmungsstaaten: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO Patent (KE, LS, MW, SD, SZ, UG), eurasisches Patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches Patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI Patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Veröffentlicht
Mit internationalem Recherchenbericht.

(54) Title: FIREPROOF SEALING SYSTEM BASED ON MOLTEN ADHESIVES AND PROCESS FOR THE FLAMEPROOF SEALING OF OBJECTS OR APERTURES

(54) Bezeichnung: BRANDHEMMENDES DICHTUNGSSYSTEM AUF BASIS VON SCHMELZKLEBSTOFFEN UND VERFAHREN ZUR FLAMMFESTEN ABDICHTUNG VON GEGENSTÄNDEN ODER ÖFFNUNGEN

(57) Abstract

The invention relates to fireproof sealing systems based on molten adhesives, containing a) a molten adhesive; b) binders; c) substances forming a carbon structure in the event of a fire; d) flame-protecting agents; and e) a component which swells in the event of a fire; and a process for the flameproof sealing of objects or apertures by the application of such sealing systems.

(57) Zusammenfassung

Die Erfindung betrifft brandhemmende Dichtungssysteme auf Basis von Schmelzklebstoffen, die a) einen Schmelzklebstoff; b) Bindemittel; c) im Brandfall Kohlenstoffgerüst bildende Substanzen; d) Flammschutzmittel; sowie e) eine im Brandfall intumeszierende Komponente enthalten, sowie ein Verfahren zur flammfesten Abdichtung von Gegenständen oder Öffnungen durch Auftragung solcher Dichtungssysteme.

Fire-retardant sealing system based on hotmelt adhesives and process for the flameproof sealing of articles or apertures

The present invention relates to a fire-retardant sealing system based on hotmelt adhesives and a process for the flameproof sealing of articles or apertures by applying such a sealing system.

Known fire-retardant sealing systems are, for example, fireproof laminates. Fireproof laminates usually consist of a fireproof material which is laminated with a carrier web, for example a nonwoven glass fiber, textile fiber or carbon fiber fabric, and are used, for example, for the production of door seals, window seals or other seals. Furthermore, fireproof laminates are also employed between glass and frame in fireproof glazing and inside fireproof doors. To permit fixing, some of the fireproof laminates are provided with an adhesive layer. In the absence of an adhesive layer, application can also be effected, for example, by screwing on or by means of nails.

However, the disadvantage of the fireproof laminates known to date is the method of application, since either the additional provision of an adhesive layer or the additional work of screwing on or nailing on is required. A further disadvantage is the loss of laminate resulting from the exact adaptation of predetermined laminate sizes to the article to be sealed in each case.

It was accordingly the object of the present invention to provide a fire-retardant sealing system which can be installed, readily and without losses, in the article to be rendered fire-retardant.

Unexpectedly, it was possible to achieve this object by the combination of fireproof components with hotmelt adhesives.

The present invention accordingly relates to fire-retardant sealing systems based on hotmelt adhesives, which contain

a) a hotmelt adhesive,
b) binders,
c) substances forming a carbon skeleton in the event of a fire,
d) flameproofing agents and
e) a component which is intumescent in the event of a fire.

The novel sealing systems are based on hotmelt adhesives. Suitable hotmelt adhesives are, for example, those based on synthetic rubbers, preferably based on so-called thermoplastic rubber grades, such as, for example, block copolymers of styrene and butadiene or isoprene or butyl rubber. Hotmelt adhesives based on low molecular weight polyethylenes (PE) and polyethylene waxes, those based on high molecular weight ethylene/vinyl acetate copolymers, those based on atactic polypropylene, those based on ethylene/acrylate copolymers, with or without a low content of carboxyl groups, those based on polyamides and polyaminoamides, those based on polyurethanes and those based on aliphatic or aromatic polyesters are also suitable.

These hotmelt adhesives may contain conventional additives, such as, for example, antioxidants, plasticizers, pigments for coloring, such as those for imparting whiteness, fillers and the like.

According to the invention, binders, for example polymeric binders, or fibers are added to the hotmelt adhesive used for the preparation of the sealing system. Examples of polymeric binders are polyvinyl acetate, polyvinyl acrylate, polyvinyl chloride copolymers or polychloroprenes. Preferred fibers are mineral fibers. Mineral fibers are

understood, depending on their starting materials, as glass, rock or slag fibers, as well as ceramic fibers. The terms mineral wool, glass wool, rock wool and slag wool are also commonly used. Preferably used binders are fibers, and mixtures of different fibers may also be employed.

Furthermore, a substance forming a carbon skeleton or carbon crust in the event of a fire is added to the hotmelt adhesive. Suitable substances are, for example, thermosetting plastics, such as, for example, formaldehyde resins, urea resins, phenol resins, phenol/formaldehyde resins, polyacrylonitrile, polyimides, melamine resins, sugar, molasses, cellulose or derivatives thereof. The resins used should preferably have a melting point between 100 and 200°C. Phenol resins and phenol/formaldehyde resins prove to be particularly advantageous. During the heating in the event of a fire, these substances initially crosslink, the strong intermolecular bonds also being retained during the further thermal load which leads to pyrolytic decomposition and finally to the formation of a paracrystalline carbon skeleton (Chemie-Ing.-Tech. 41 No. 9/10 (1970), pages 659-669).

As a third component, a flameproofing agent is mixed with the hotmelt adhesive to render the latter flameproof. Examples of suitable flameproofing agents are aluminum hydroxide, aluminum oxide trihydrate, magnesium hydroxide, calcium carbonate, boron compounds, ammonium sulfamate or urea. For example, oxides and carbonates of metals, such as, for example, bismuth, tin, iron, antimony or molybdenum oxides or bismuth carbonate, and other conventional flameproofing agents may furthermore be used.

A component which is intumescent in the event of a fire is also added. Suitable intumescent components are all components or substances which foam

in the event of a fire and are present in solid form, for example as powder or granules. These are, for example, components based on expanded graphite, silicates, polyurethanes, nitrogen compounds or phosphorus compounds, as disclosed, for example, in EP-B-153 564 or EP-B-338 347. Expanded graphite or a component based on phosphorus compounds is preferably used.

The amounts of the individual components in the sealing systems according to the invention depend on the requirements which their properties have to meet and on the required behavior in the event of a fire, a high content of intumescent component having an advantageous effect on the fire behavior, a high content of binders having an advantageous effect on the flexibility and a high content of substances which form a carbon skeleton in the event of a fire having an advantageous effect on the strength of the sealing systems in the event of a fire.

The sealing systems according to the invention preferably contain

a) 30 to 70% by weight, particularly preferably 40 to 60% by weight, of hotmelt adhesive,

b) 1 to 15% by weight, particularly preferably 3 to 10% by weight, of binder,

c) 1 to 15% by weight, particularly preferably 3 to 10% by weight, of substances forming a carbon skeleton in the event of a fire,

d) 1 to 25% by weight, particularly preferably 1 to 15% by weight, of flameproofing agents and

e) 10 to 40% by weight, particularly preferably 15 to 30% by weight, of intumescent components.

The preparation of the sealing systems according to the invention is carried out by simply mixing together and melting together the individual components, for example in a heatable stirred vessel.

The melt thus obtained is then fabricated in a tabletting or granulating apparatus. The melts are, for example, dripped onto a cooling belt or applied as a film to a cooling belt for solidification and then cut. Heatable kneaders or extruders, downstream of which appropriate fabrication means are connected, are preferably used.

The flameproof sealing of the articles or apertures to be protected is then preferably effected by means of apparatuses usually used for applying hotmelt adhesives, for example a so-called jet applicator or a hotmelt hand gun. The granular or tablet-like sealing system is preferably liquefied in a premelt container under atmospheric pressure at a temperature of between 100 and 200°C and then applied through the applicator nozzles. The application can be adjusted in a very exact and variable manner by means of the type and bore of the nozzle, the pressure of the fireproof laminate and the control of the nozzle orifice. After cooling and solidifying, the sealing system adheres firmly, by means of the hotmelt adhesive present, to the article to be protected.

By means of the fire-retardant sealing system according to the invention, imparting flame-retardancy, for example, fireproof glazing, fireproof doors and other apertures to be sealed, for example, joints or cable ducts, is substantially facilitated, and furthermore there are no losses as in the adaptation of conventional sealing systems in laminate form.

Example

For the preparation of a fire-retardant sealing system, 50% by weight of a commercial hotmelt adhesive based on vinyl acetate (from Fuller), 10% by weight of a phenol resin (Resin 122, from Ceca), 5% by weight of Inorphil (mineral fibers), 15% by weight of aluminum

hydroxide and 20% by weight of expanded graphite are melted together in a heated stirred vessel. The melt is then applied as a film to a cooling belt for solidification and is then cut, after which the sealing system in granular form is obtained.

Fire-retardant sealing system based on hotmelt adhesives and process for the flameproof sealing of articles or apertures

The present invention relates to a fire-retardant sealing system based on hotmelt adhesives and a process for the flameproof sealing of articles or apertures by applying such a sealing system.

Known fire-retardant sealing systems are, for example, fireproof laminates. Fireproof laminates usually consist of a fireproof material which is laminated with a carrier web, for example a nonwoven glass fiber, textile fiber or carbon fiber fabric, and are used, for example, for the production of door seals, window seals or other seals. Furthermore, fireproof laminates are also employed between glass and frame in fireproof glazing and inside fireproof doors. To permit fixing, some of the fireproof laminates are provided with an adhesive layer. In the absence of an adhesive layer, application can also be effected, for example, by screwing on or by means of nails.

However, the disadvantage of the fireproof laminates known to date is the method of application, since either the additional provision of an adhesive layer or the additional work of screwing on or nailing on is required. A further disadvantage is the loss of laminate resulting from the exact adaptation of predetermined laminate sizes to the article to be sealed in each case.

It was accordingly the object of the present invention to provide a fire-retardant sealing system which can be installed, readily and without losses, in the article to be rendered fire-retardant.

Unexpectedly, it was possible to achieve this object by the combination of fireproof components with hotmelt adhesives.

The present invention accordingly relates to fire-retardant sealing systems based on hotmelt adhesives, which contain

a) a hotmelt adhesive,
b) binders,
c) substances forming a carbon skeleton in the event of a fire,
d) flameproofing agents and
e) a component which is intumescent in the event of a fire.

The novel sealing systems are based on hotmelt adhesives. Suitable hotmelt adhesives are, for example, those based on synthetic rubbers, preferably based on so-called thermoplastic rubber grades, such as, for example, block copolymers of styrene and butadiene or isoprene or butyl rubber. Hotmelt adhesives based on low molecular weight polyethylenes (PE) and polyethylene waxes, those based on high molecular weight ethylene/vinyl acetate copolymers, those based on atactic polypropylene, those based on ethylene/acrylate copolymers, with or without a low content of carboxyl groups, those based on polyamides and polyaminoamides, those based on polyurethanes and those based on aliphatic or aromatic polyesters are also suitable.

These hotmelt adhesives may contain conventional additives, such as, for example, antioxidants, plasticizers, pigments for coloring, such as those for imparting whiteness, fillers and the like.

According to the invention, binders, for example polymeric binders, or fibers are added to the hotmelt adhesive used for the preparation of the sealing system. Examples of polymeric binders are polyvinyl acetate, polyvinyl acrylate, polyvinyl chloride copolymers or polychloroprenes. Preferred fibers are mineral fibers. Mineral fibers are

understood, depending on their starting materials, as glass, rock or slag fibers, as well as ceramic fibers. The terms mineral wool, glass wool, rock wool and slag wool are also commonly used. Preferably used binders are fibers, and mixtures of different fibers may also be employed.

Furthermore, a substance forming a carbon skeleton or carbon crust in the event of a fire is added to the hotmelt adhesive. Suitable substances are, for example, thermosetting plastics, such as, for example, formaldehyde resins, urea resins, phenol resins, phenol/formaldehyde resins, polyacrylonitrile, polyimides, melamine resins, sugar, molasses, cellulose or derivatives thereof. The resins used should preferably have a melting point between 100 and 200°C. Phenol resins and phenol/formaldehyde resins prove to be particularly advantageous. During the heating in the event of a fire, these substances initially crosslink, the strong intermolecular bonds also being retained during the further thermal load which leads to pyrolytic decomposition and finally to the formation of a paracrystalline carbon skeleton (Chemie-Ing.-Tech. 41 No. 9/10 (1970), pages 659-669).

As a third component, a flameproofing agent is mixed with the hotmelt adhesive to render the latter flameproof. Examples of suitable flameproofing agents are aluminum hydroxide, aluminum oxide trihydrate, magnesium hydroxide, calcium carbonate, boron compounds, ammonium sulfamate or urea. For example, oxides and carbonates of metals, such as, for example, bismuth, tin, iron, antimony or molybdenum oxides or bismuth carbonate, and other conventional flameproofing agents may furthermore be used.

A component which is intumescent in the event of a fire is also added. Suitable intumescent components are all components or substances which foam

in the event of a fire and are present in solid form, for example as powder or granules. These are, for example, components based on expanded graphite, silicates, polyurethanes, nitrogen compounds or phosphorus compounds, as disclosed, for example, in EP-B-153 564 or EP-B-338 347. Expanded graphite or a component based on phosphorus compounds is preferably used.

The amounts of the individual components in the sealing systems according to the invention depend on the requirements which their properties have to meet and on the required behavior in the event of a fire, a high content of intumescent component having an advantageous effect on the fire behavior, a high content of binders having an advantageous effect on the flexibility and a high content of substances which form a carbon skeleton in the event of a fire having an advantageous effect on the strength of the sealing systems in the event of a fire.

The sealing systems according to the invention preferably contain

a) 30 to 70% by weight, particularly preferably 40 to 60% by weight, of hotmelt adhesive,

b) 1 to 15% by weight, particularly preferably 3 to 10% by weight, of binder,

c) 1 to 15% by weight, particularly preferably 3 to 10% by weight, of substances forming a carbon skeleton in the event of a fire,

d) 1 to 25% by weight, particularly preferably 1 to 15% by weight, of flameproofing agents and

e) 10 to 40% by weight, particularly preferably 15 to 30% by weight, of intumescent components.

The preparation of the sealing systems according to the invention is carried out by simply mixing together and melting together the individual components, for example in a heatable stirred vessel.

The melt thus obtained is then fabricated in a tabletting or granulating apparatus. The melts are, for example, dripped onto a cooling belt or applied as a film to a cooling belt for solidification and then cut. Heatable kneaders or extruders, downstream of which appropriate fabrication means are connected, are preferably used.

The flameproof sealing of the articles or apertures to be protected is then preferably effected by means of apparatuses usually used for applying hotmelt adhesives, for example a so-called jet applicator or a hotmelt hand gun. The granular or tablet-like sealing system is preferably liquefied in a premelt container under atmospheric pressure at a temperature of between 100 and 200°C and then applied through the applicator nozzles. The application can be adjusted in a very exact and variable manner by means of the type and bore of the nozzle, the pressure of the fireproof laminate and the control of the nozzle orifice. After cooling and solidifying, the sealing system adheres firmly, by means of the hotmelt adhesive present, to the article to be protected.

By means of the fire-retardant sealing system according to the invention, imparting flame-retardancy, for example, fireproof glazing, fireproof doors and other apertures to be sealed, for example, joints or cable ducts, is substantially facilitated, and furthermore there are no losses as in the adaptation of conventional sealing systems in laminate form.

Example

For the preparation of a fire-retardant sealing system, 50% by weight of a commercial hotmelt adhesive based on vinyl acetate (from Fuller), 10% by weight of a phenol resin (Resin 122, from Ceca), 5% by weight of Inorphil (mineral fibers), 15% by weight of aluminum

hydroxide and 20% by weight of expanded graphite are melted together in a heated stirred vessel. The melt is then applied as a film to a cooling belt for solidification and is then cut, after which the sealing system in granular form is obtained.

Patent claims

1. A fire-retardant sealing system based on hotmelt adhesives, which contains

a) a hotmelt adhesive,

b) binders,

c) substances forming a carbon skeleton in the event of a fire,

d) flameproofing agents and

e) a component which is intumescent in the event of a fire.

2. The fire-retardant sealing system as claimed in claim 1, which contains

a) 30 to 70% by weight, particularly preferably 40 to 60% by weight, of hotmelt adhesive,

b) 1 to 15% by weight, particularly preferably 3 to 10% by weight, of binder,

c) 1 to 15% by weight, particularly preferably 3 to 10% by weight, of substances forming a carbon skeleton in the event of a fire,

d) 1 to 25% by weight, particularly preferably 1 to 15% by weight, of flameproofing agents and

e) 10 to 40% by weight, particularly preferably 15 to 30% by weight, of an intumescent component.

3. The fire-retardant sealing system as claimed in claim 1 or 2, wherein the hotmelt adhesive used is a hotmelt adhesive based on synthetic rubbers, one based on low molecular weight polyethylenes (PE) and polyethylene waxes, one based on high molecular weight ethylene/vinyl acetate copolymers, one based on atactic polypropylene, one based on ethylene/acrylate copolymers, with or without a low content of carboxyl groups, one based on polyamides and polyaminoamides, one based on polyurethanes and one based on aliphatic or aromatic polyesters.

4. The fire-retardant sealing system as claimed in at least one of claims 1-3, which contains a polymeric binder or fibers as the binder.

5. The fire-retardant sealing system as claimed in claim 4, which contains mineral fibers as the binder.

6. The fire-retardant sealing system as claimed in at least one of claims 1-5, which contains thermosetting plastics as the substance forming the carbon skeleton in the event of a fire.

7. The fire-retardant sealing system as claimed in claim 6, which contains formaldehyde resins, urea resins, phenol resins, phenol/formaldehyde resins, melamine resins or polyimides as the thermosetting plastic.

8. The fire-retardant sealing system as claimed in at least one of claims 1-7, which contains aluminum hydroxide, aluminum oxide trihydrate, magnesium hydroxide, calcium carbonate, boron compounds, ammonium sulfamate, urea or oxides or carbonates of metals as the flameproofing agent.

9. The fire-retardant sealing system as claimed in at least one of claims 1-8, which contains, as the component which is intumescent in the event of a fire, one based on expanded graphite, silicates, polyurethanes, nitrogen compounds or phosphorus compounds.

10. The fire-retardant sealing system as claimed in claim 9, which contains expanded graphite or a component based on phosphorus compounds as the component which is intumescent in the event of a fire.

11. A process for the flameproof sealing of articles or apertures by applying the sealing systems as claimed in at least one of claims 1 to 10 by means of conventional applicators for hotmelt adhesives.

12. The process as claimed in claim 11, the application being effected by spraying or in bead form.